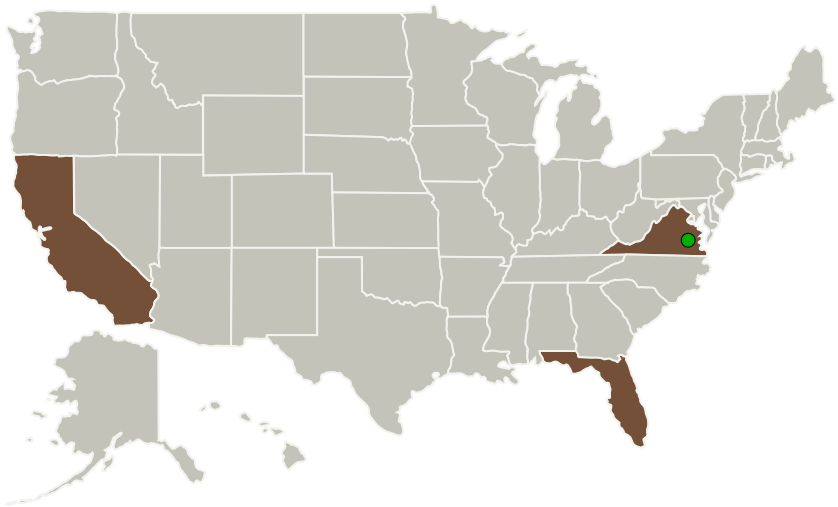
Fiber Optic Acoustic Emission System for Structural Health Monitoring of Composite Pressure Vessels, Phase I

Completed Technology Project (2015 - 2016)

Project Introduction

Pressurized systems and pressure vessels used in NASA ground-based and flight-based applications including fuel tanks, composite overwrapped pressure vessels (COPVs), and composite tankage commonly suffer from several types of degradation including fatigue, cracking, lack of bonding, and leakage. Veraphotonics proposes to develop a pressure vessel leak and damage detection system. In a large vessel, in-line inspection using health-monitoring sensors would provide structural integrity assessment, reduce maintenance, and eliminate potential points of failure. Acoustic Emission (AE) method is the most prevalent method that provides continuous monitoring for leak and damage detection as well as estimates the location of leak or damage in pressure vessels. In this SBIR Phase I project, the feasibility of a novel laser-based interrogation technique AE method for the detection of leak and damages in liquid-filled vessel instrumented with FBG sensors will be performed in laboratory and field vessels including COPVs. Based on laboratory and field test measurements, we will optimize the FBG sensors and the system to reduce or eliminate the acoustic background noise from the vessel environment. In Phase II all the FBG sensors will be integrated on a single optical fiber and interrogated using a compact, battery powered interrogation device with wireless data transmission capability.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Veraphotonics, Inc.	Lead Organization	Industry	fremont, California
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
University of Miami	Supporting Organization	Academia	Coral Gables, Florida

Primary U.S. Work Locations	
California	Florida
Virginia	

Project Transitions

June 2015: Project Start

June 2016: Closed out

Closeout Summary: Fiber Optic Acoustic Emission system for structural health monitoring of Composite Pressure Vessels, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/139007)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Veraphotonics, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

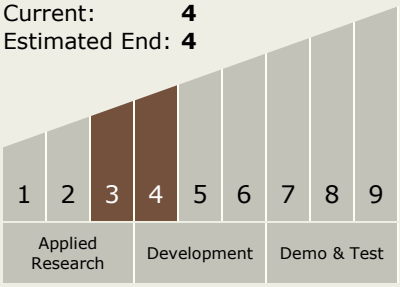
Carlos Torrez

Principal Investigator:

An-dien Nguyen

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Images

Briefing Chart Image
Fiber Optic Acoustic Emission system for structural health monitoring of Composite Pressure Vessels, Phase I
(https://techport.nasa.gov/image/130540)

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.1 Integrated Systems and Ancillary Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System